

PATENT SPECIFICATION

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(54) MANUALLY CONTROLLED ELECTRIC SWITCHES

(71) We, ETABLISSEMENT GERARD MANG, a body corporate organized and existing under the laws of France 7, Avenue Claude-Vellefaux, Paris X^o, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to manually controlled electric switches of the kind commonly referred to as "push-buttons".

Until recent years the construction and characteristics of these appliances has changed very little. It was accepted that the operating stroke of their operative elements should be relatively long (one to several millimetres), and that the force required to be applied for operating them should be fairly considerable.

Nevertheless, when reasons of appearance and amenity prevail, as is the case in buildings, offices, and numerous public premises, it is at the present time required that appliances of this kind should have certain very particular characteristics, particularly:

a) an operating button of large area;
b) a very short or nearly zero operating stroke;

c) the ability to operate the control button at any point of the latter;

d) a very small force required to effect this operation.

To this end, control push-buttons have already been proposed in which an assembly of levers is provided for transmitting the movement of the button to a microswitch, thus making it possible to provide a very short stroke for the corresponding button; in this case, however, the force to be provided is increased in the same proportion.

Furthermore, devices of this kind have another disadvantage, namely the fact that the operation of their control button can usually be effected only by acting on one particular region of the button. This

being the case, these devices consequently do not entirely satisfy all the conditions indicated above.

However, more recent devices exist which may satisfy all these conditions. These are entirely static devices which are also known "touch" or "proximity" switches or "minimum contact plates". These devices operate with the aid of electronic means through variation of insulation or capacitance. Nevertheless, they have the major disadvantage of being expensive because of their very design. Moreover, their operation is sometimes very delicate.

It is for these reasons that the present invention has the object of providing a contactor capable of satisfying the various conditions indicated and of being equally agreeable to use as the minimum contact electronic plates, while nevertheless having a far lower cost price, which is very close to that of an ordinary push-button.

The present invention provides a manually-operable push-button switch for closing an electric circuit, and comprising a casing; two terminals to which external electrical conductors can be connected; at least one fixed electrically conductive element in the casing extending from respective terminals and electrically connected thereto, the element being divided into a plurality of parts which are separated by insulating gaps; electrical contact members in the casing which are movable towards respective gaps to bridge the gaps, the movable contact members being held apart from the fixed element by springs; and a movable cover plate forming a control button which can be manually pressed to move the contact members into electrical contact with the fixed element, the movable contact members being arranged in independent groups each comprising at least two members and spaced apart in the casing from other groups, each group being arranged adjacent respective insulating gaps and the construction and arrangement being such

that contact between all of the movable contact members of any one group and the adjacent parts of the element closes said electric circuit.

5 Preferably the groups of movable contact members are three in number and are separated from each other as widely as possible, commensurate with the dimensions of the casing.

10 Preferably the divided conductive element provides a plurality of fixed electrically conductive members mounted on a fixed support or on the bottom of the casing, the shape and arrangement of these fixed members being such that opposite each group of movable contact members there is a number of insulating gaps corresponding to the number of movable contacts in each of these groups.

20 Preferably two main fixed conductive members are provided, each of which is connected to a terminal as aforesaid and which are so shaped that adjacent each independent group of contacts they define a gap in which is provided at least one intermediate fixed conducting member separated from the two main fixed conductive members by two insulating gaps, opposite which two movable contact members are provided.

30 Preferably the movable contact members are mounted on a common support constituted by a moveable intermediate plate provided with recesses in each of which one of these contact members is resiliently mounted by a system of bayonet-type fastening with the interposition of a spring.

40 Preferably the intermediate plate is positioned relative to the casing by studs on which are attached retaining heads forming stops.

45 Nevertheless, other features and advantages of a switch according to the invention will appear in the course of the following description of one example of construction of the switch. This description is given with reference to the accompanying drawings and simply by way of example.

50 Figure 1 is a side view in elevation of a theoretical construction of a switch according to the present invention;

55 Figure 2 is a corresponding top plan view in which the movable operating plate has been removed in order to make the drawing clearer;

60 Figure 3 is a view in axial section of a particular form of construction of a switch according to the invention;

Figure 4 is a top plan view of the support on which are provided the fixed conductor members, opposite which the movable contacts are disposed;

65 Figure 5 is a bottom plan view of a

movable intermediate plate provided behind the control button and serving as support for the movable contacts;

Figure 6 is a view in perspective showing a movable contact before its assembly, together with a recess provided to receive it in its support;

Figure 7 is a view in vertical section of a switch according to the invention, shown in a flush-mounted position in a wall.

The essential feature of a switch according to the invention resides in the fact that the connecting circuit between the connection terminals 1 and 2 is divided into a certain number of contact members 3 separated from one another by an insulating gap 4. Opposite each of the latter is provided a movable connecting contact 5 adapted to constitute a connection bridge between the two neighbouring conductor members 3.

The different connecting contacts 5 are carried by a common plate 6, which thus constitutes the control button of the switch, suitably disposed springs 7 holding the connecting contacts away from the conductor member 3.

However, it is sufficient to apply pressure to the button 6 to effect the simultaneous application of all the connecting contacts against the conductor members, and consequently to achieve the closing of the corresponding circuit.

Because of the division of the latter into conductor zones separated from one another, the break distance between each connecting contact 5 and one of these members can be reduced to a very low value, for example 0.2 mm. Two break gaps correspond to each connecting contact. Thus, in the embodiment illustrated in Figures 1 and 2 there is provided a succession of three connecting contacts corresponding to six break gaps. This being the case, a stroke of 0.2 mm for each of them provides a total break distance of 1.2 mm.

It is obviously possible to vary the number of connecting contacts and also their stroke in order to obtain the desired total break distance.

Nevertheless, in order to obtain good operation of the switch and above all to permit easy and reliable manufacture, it is convenient to provide for the switch a particular construction, one example of which is shown in Figure 3 to 6 in the drawings.

This switch comprises a casing 8 of insulating material, for example of moulded plastics material. Against the bottom of this casing is disposed a fixed plate 9 serving as support for the divided conductor element connecting the two connection terminals 11

and 12 of the apparatus. This element consists of conductor members formed by a printed circuit 10 attached to the support 9, which may have a cavity in its central portion in order to give access to the conductors and connection terminals.

The illustrated switch comprises three independent groups of connecting contacts each adapted to effect the closure of the corresponding circuit, the interengagement of the contacts of any one of these groups being sufficient to effect its closure. In the present case these three groups of contacts are disposed substantially at the positions of the apices of a triangle ABC whose sides are as large as possible, taking into account the dimensions of the casing 8. Each group comprises two contacts 13a, 13b, 13c, the two contacts of each group being disposed one on each side of the corresponding apex of the triangle ABC.

Consequently, the conductor zones provided on the plate 9 are so arranged as to have two interruptions opposite each group of movable contacts. To this end, two main conductor members 14 and 15 are provided, which are connected respectively to the two terminals 11 and 12. These members have extensions which are imbricated with one another in such a manner as to be disposed on each side of the position of each group of contacts, leaving between them in this position a relatively large gap. This gap carries an intermediate conductor, respectively 16a, 16b, and 16c.

On each side of it each of these intermediate conductors leaves two insulating bands, respectively bearing the references 17a, 17b and 17c. The connecting contacts 13a, 13b, and 13c of each group are situated above each of these insulating bands and are adapted to form a connecting bridge between the conducting members situated on each side when they are brought into contact with these members.

The connecting contacts 13a, 13b, 13c are mounted in a movable intermediate plate 18, which serves as a common support for them. To this end, this plate is provided with a corresponding number of recesses 19, in each of which a connecting contact 13 is placed. This contact consists of a small metal cup provided with two side lugs 20 enabling it to be held in place in the corresponding recess 19 by fastening after the style of a bayonet-type connection system.

To this end the entry of each recess 19 provided in the intermediate plate 18 has two diametral slots 21 adapted to permit the passage of the lugs 20 of the corresponding contact 13. These slots give access to angularly offset cavities 22 which are

intended to receive the lugs 20 after the contact 13 has been turned a fraction of a revolution.

Before each contact is placed in position, a spring 24 is placed inside the contact and thus bears against the bottom of the corresponding recess 19. A shoulder 23 provided at the entry of each cavity 22 prevents accidental disengagement of the fastening lugs 20 of each contact.

Because of this system of mounting, the contacts 13 can slide freely in their recess by compressing the springs 24. When at rest they project slightly beyond the corresponding face of the intermediate plate 18. The outer faces of these contacts are then all in the same plane.

The intermediate plate 18 is mounted for sliding inside the casing 8, the sliding being effected in a direction perpendicular to the bottom of the latter.

However, this plate is held in position by stops formed by heads 25 attached to studs 26 carried by the bottom of the casing 8.

These studs are engaged in holes provided in the intermediate plate 18, which can slide along these studs. The heads 25 may be fixed in position by any suitable means, for example by screws 27.

In the example illustrated three studs 26 are thus provided which are disposed at or adjacent the apices of a triangle, (see Figure 5). Only one of them also has the object of providing guidance for the intermediate plate 18 in its movements. This is the stud bearing the reference 26a. However, another centring and guiding element is provided, namely peg 28 which is likewise carried by the bottom of the casing and is engaged in a corresponding hole in the intermediate plate 18.

Springs 29 are interposed between the fixed plate 9 and the movable intermediate plate 18, so as to push back the latter in order to hold the connecting contacts 13a, 13b, 13c away from the corresponding conducting zones of the printed circuit 10 (see Figure 3).

The intermediate plate 18 is capped by a cover plate 30, which thus constitutes the external control button of the apparatus. This plate may be fixed on the intermediate plate 18 by elastic clipping with the aid of engaging projections 31.

Because each of the conductor circuits capable of connecting the two terminals 11 and 12 is divided into a plurality of parts, and consequently because of the necessity to operate a plurality of connecting contacts 13 in order to effect the closing of a circuit of this kind, the movement provided for these contacts is reduced to an extremely small value e (see Figure 3), as has already been explained above.

Consequently, it is sufficient to impart a

very slight movement to the button 30 to make a connection between the two terminals 11 and 12.

In this connection it should be noted that because of the presence of a plurality of independent groups of connecting contacts and of their distribution behind the operating button, the latter can be operated at any point. It is in fact not necessary for all the groups of contacts to move into the connecting position, since the operation of a single group is sufficient.

This being the case, a switch according to the invention affords practically the same advantages as an electronic minimum contact plate, since the circuit can be closed by very slight pressure on the control button.

Nevertheless, this switch differs from electronic minimum contact plates in that its cost price is much lower and is close to that of an ordinary push-button, this being due to the absence of any electronic component.

It should also be noted that the particular arrangement of the connecting contacts 13 and their method of mounting makes it possible to obtain very small dimensions, and in particular to obtain a relatively slight thickness for the entire switch. Furthermore, the mounting of its contacts is very easy and it is possible for very great manufacturing precision to be obtained without difficulty.

It should also be observed that the arrangement of the stops constituted by the heads 25 attached to the studs 26 makes it possible for an accurate movement to be imparted to the connecting contacts 13 whatever the thickness of the printed circuit constituting the connection zones 10. This is due to the fact that these heads are arranged to be supported on this printed circuit, which makes it possible to take into account any variations in the thickness of the latter. Moreover, the movement imparted to the connecting contacts is determined by a minimum number of dimensions, and the arrangement provided makes it possible to ensure that the outer faces of all the contacts are situated in the same plane when at rest.

The design of a switch according to the invention makes it possible to provide, for the latter, a new and particularly discreet form of installation. It can in fact be entirely embedded in a cavity 32 provided in a wall 33 and disposed behind the wall covering 34 of the wall, provided that this covering is slightly flexible. This is of course generally the case, because the covering is usually a sheet of paper or plastics material or else a covering fabric. Because of the very slight movement needed for the

connecting contacts 13, the circuit of the apparatus can then be perfectly closed by applying slight pressure to the portion of the wall covering sheet 34 which is situated opposite the operating button 30. To this end the situation of the apparatus may be discreetly indicated by a small plate attached to the covering sheets 34, for example by adhesive bonding.

A switch according to the present invention may obviously also be flush-mounting in conventional manner so that the control button 30 can be seen on the outside. The switch may optionally be provided with a small fluorescent lamp in order to form an illuminated push-button.

It is quite obvious that a switch according to the invention is not limited solely to the practical example of embodiment described above. The number of groups of connecting contacts and their geometrical distribution may in fact vary. Nevertheless, in the case of an apparatus of square external shape, the presence of three groups of contacts distributed at or adjacent the apices of a triangle is found particularly advantageous. This apparatus in fact considerably reduces the disadvantages which may result from any deformation of the intermediate plate 18 serving as support for the contacts.

Furthermore, it is obvious that the arrangement of the movable contacts and the method of mounting them could also be modified, provided that each of these contacts is able to form a connecting bridge between two conductor zones disposed one on each side of the insulating zone or band opposite which the corresponding contact is placed.

A switch according to the invention can advantageously replace conventional push-buttons, particularly when for reasons of appearance and amenity it is preferable to use devices comprising a control button of large area and a very short operating stroke.

WHAT WE CLAIM IS:—

1. A manually-operable push-button switch for closing an electric circuit, and comprising a casing; two terminals to which external electrical conductors can be connected; at least one fixed electrically conductive element in the casing extending from respective terminals and electrically connected thereto, the element being divided into a plurality of parts which are separated by insulating gaps; electrical contact members in the casing which are movable towards respective gaps to bridge the gaps, the movable contact members being held apart from the fixed element by springs; and a movable cover plate forming a control button which can be manually

pressed to move the contact members into electrical contact with the fixed element, the movable contact members being arranged in independent groups each comprising at least two members and spaced apart in the casing from other groups, each group being arranged adjacent respective insulating gaps and the construction and arrangement being such that contact between all of the movable contact members of any one group and the adjacent parts of the element closes said electric circuit.

2. A switch according to Claim 1, wherein the groups of movable contact members are three in number and are separated from each other as widely as possible commensurate with the dimensions of the casing.

3. A switch according to either one of Claims 1 and 2, wherein the divided conductive element provides a plurality of fixed electrically conductive members mounted on a fixed support or on the bottom of the casing, the shape and arrangement of these fixed members being such that opposite each group of movable contact members there is a number of insulating gaps corresponding to the number of movable contacts in each of these groups.

4. A switch according to Claim 3, wherein two main fixed conductive

members are provided, each of which is connected to a terminal as aforesaid and which are so shaped that adjacent each independent group of contacts they define a gap in which is provided at least one intermediate fixed conducting member separated from the two main fixed conductive members by two insulating gaps, opposite which two movable contact members are provided.

5. A switch according to any one of the preceding Claims, wherein the movable contact members are mounted on a common support constituted by a movable intermediate plate provided with recesses in each of which one of these contact members is resiliently mounted by a system of bayonet-type fastening with the interposition of a spring.

6. A switch according to Claim 5, wherein the intermediate plate is positioned relative to the casing by studs on which are attached retaining heads forming stops.

7. A switch according to Claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

6 SHEETS

*This drawing is a reproduction of
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Sheet 1

Fig1

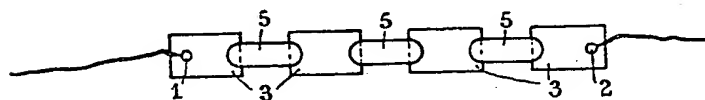
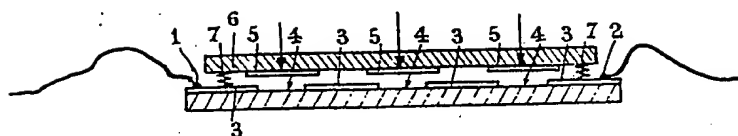


Fig.2

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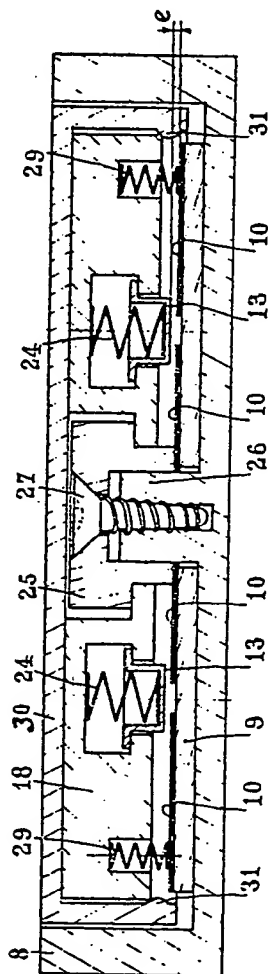
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6 SHEETS

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Sheet 2

Fig:3

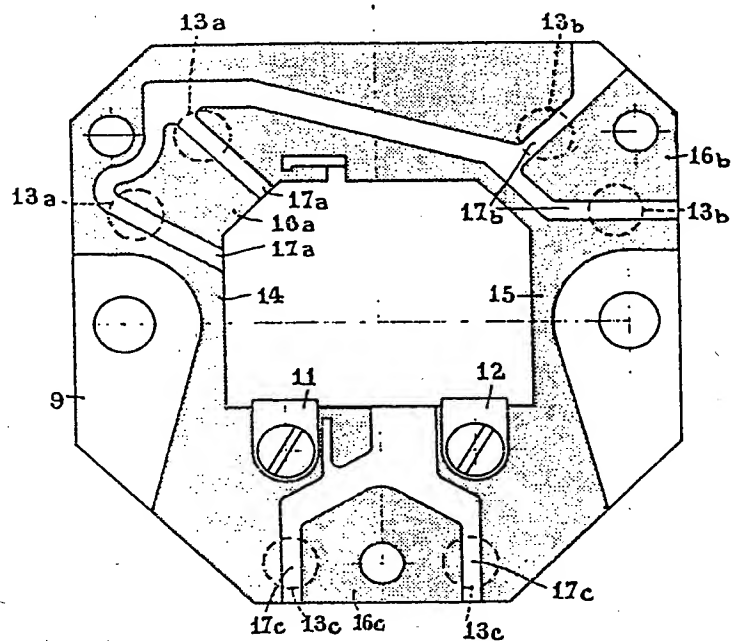


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Sheet 3

Fig.4



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Fig:5

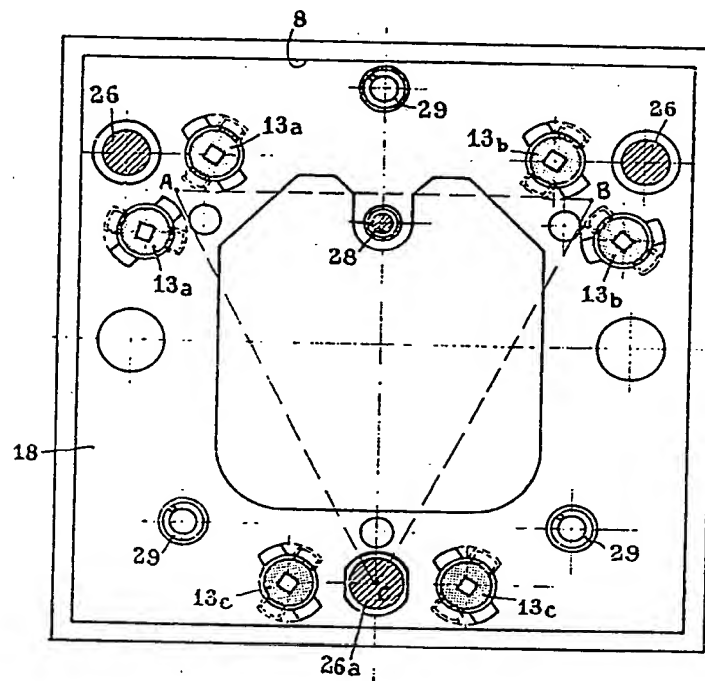
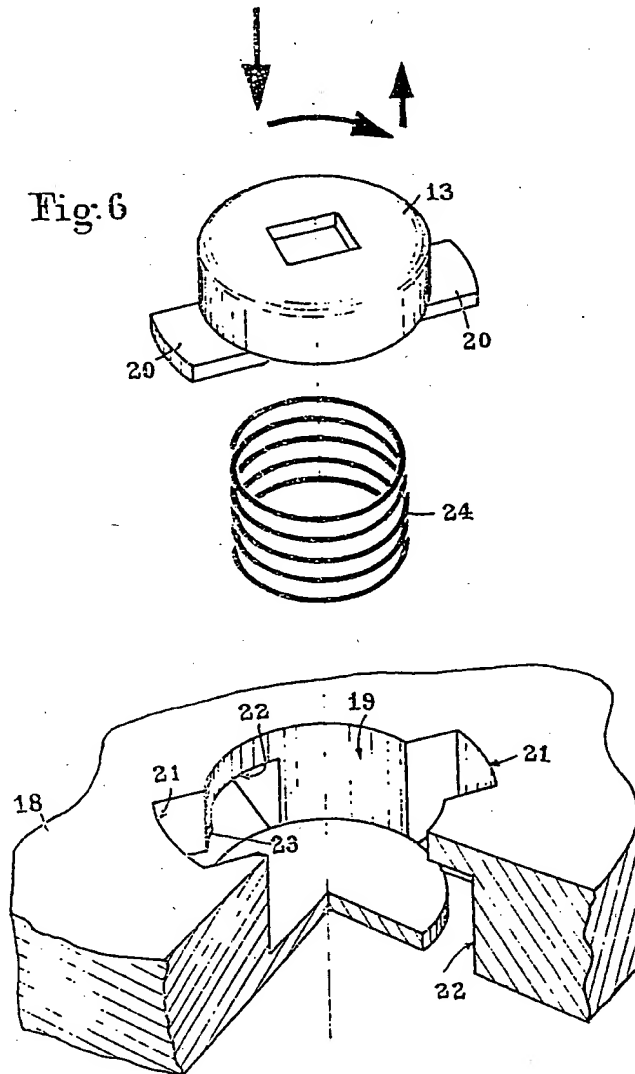


Fig. 6



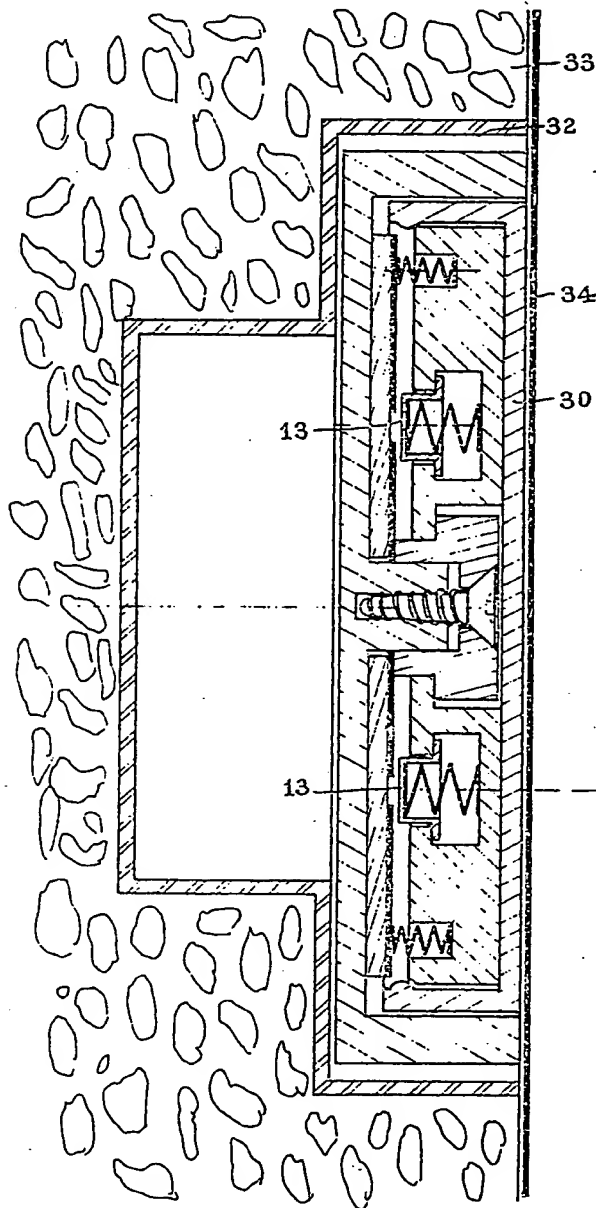


Fig. 7

